

Remarks/Arguments

Claims 1-10 remain in this application and now stand Finally Rejected. Applicants request reconsideration of the rejection in view of the following remarks which place the application in better consideration for consideration in accordance with 37 C.F.R. 1.116(b).

Before proceeding to address the examiner's rejections, applicants will briefly summarize their invention to assist the examiner in better appreciating the differences between the claimed invention and the art of record. As recited in claim 1 as previously amended, applicants provide a method for performing semi-automatic tracking of colored objects within a video image. The method commences by separating image within the initial frame based on color. A user provides an input selecting an object of interest by identifying a centroid of that object. The selected object is tracked through successive frames using a Kalman predictive algorithm applied to the centroid.

35 U.S.C. 103(a) Rejection of Claims 1-5

The examiner has Finally Rejected claims 1-5 under 35 U.S.C. 103(a) as obvious over U.S. Patent 6,278,460, issued August 21, 2001, in the name of Thomas R. Myers et al., from an application filed December 15, 1998, over U.S. Patent 5,960,097, issued September 28, 1999, in the name of Carl G. Pfeiffer et al., from an application filed January 21, 1997. Applicants respectfully traverse the rejection.

The Myers et al. patent concerns a technique for creating a three-dimensional model from a plurality of two-dimensional images obtained from a video camera. The method commences by obtaining two-dimensional images from the video camera and then using a "ray casting" technique to develop a three dimensional image based on the notion of intersecting rays through common features of the two-dimensional images.

The examiner should appreciate that the Myers et al. patent is not concerned with the tracking of an object, let alone tracking of different objects separated by colors. While it is true that Myers et al. track a few selected images, they do so to establish the position of the camera, not the position of the object.

The Pfeiffer et al. patent concerns a technique for tracking objects, such as missiles, by separating target data from background data. The tracking of an object of interest is initiated by storing line of sight vector data while false detections are reduced by assuming the objects follow established paths. Observation times are scheduled to observe the object, and a sequence of line-of-sight pointing commands are calculated to cause a tracking sensor to be skewed to observe the

object during the observation intervals. A background adaptive streak detection algorithm is used to detect the object. Data from the acquisition and tracking sensors are combined to form data tracks while the background adaptive streak detection algorithm parameters are controlled to adapt to changing conditions.

Like the Myers et al. patent, the Pfeiffer et al. patent is not concerned with the tracking of different objects separated by colors.

In rejecting applicants' claims 1-5, the examiner contends that the Myers et al. patent teaches all of the features of applicants' method with the exception of tracking of an object through successive frames using an Kalman filter. For that teaching, the examiner relies on the Pfeiffer et al. patent. As discussed below, applicants maintain that the examiner's reliance on the Myers et al. patent to teach all of the features of applicants' claims except for Kalman tracking is misplaced.

In support of the rejection, the examiner asserts that the Myers et al. patent teaches applicants' steps of:

- separating objects within an initial frame of the video image sequence on the basis of color; and
- receiving a user-provided input that selects an object of interest from the separated objects by a user identifying a centroid of the object of interest

In an effort to prove that the Myers et al. patent teaches applicants' separating step, the examiner refers to Col. 8, lines 23-45 which provides:

"Advantageously, the resolution of the three-dimensional point cloud model may be greater than the resolution of the source charge coupled device (CCD) used to create the video stream. Sub-voxel data may be interpolated through the inherent nature of how the voxel data is stored--linear color gradient interpolation. As subsequent intersecting rays are calculated, the intersection geometry is actually a minimal length line between the rays rather than an actual point for the majority of the rays. These lines are composed of separate color values for the endpoints of the line with the midpoint on the line representing the approximate true intersection point of the rays. By dealing with the intersection points as a gradient along a line, sub-voxel resolution is generated. The larger number of intersection points calculated yields a higher resolution for the model than for the video source. Through this process, a video camera with a 512.times.384 pixel resolution is able to capture surface texture resolution many orders of magnitude larger than each individual frame. For example, 100 frames of 512.times.384 frames (196,608 pixels per frame) yields a maximum of 19,660,800*N voxels possible with subpixel improvement of N increments. The resolution and subdivision are limited only by the color bit depth of the source data."

The examiner also relies on the disclosure in the Myers patent at Col. 10, lines 32-49 which provides:

Beginning at block 406, the method determines intersections of rays cast through pixels of feature 506 in frames 502 and 504. At block 406, the method compares the quality value for the pixel 509 associated with ray 508 with the quality value of pixel 512 associated with ray 510. At block 408, the method determines whether the quality

values match within selected bounds. If the quality values match within the selected bounds, the method casts rays and calculates the three-dimensional intersection at block 410. At block 412, the method determines whether the three-dimensional intersection falls within selected bounds. If the intersection falls within the selected bounds, then the method proceeds to block 414 and writes a data point to the point cloud, e.g., data point 514. Each data point consists of six fields: the x, y, and z coordinates, and the R, G, and B values. These values may be the average of the values for the rays 508 and 510 at the intersection or some other appropriate representation of each individual data set.

Neither of these two cited portions of the Myers et al. patent teaches or suggests applicants' step of separating objects within a video frame by color. The cited section at Col. 8, lines 23-45 of the Myers et al. patent deals with interpolation of volumetric pixel (voxel) data using a color linear gradient. Such voxel interpolation has nothing to do with separating objects by color, but rather with improving the resolution of a point within the three-dimensional cloud. The cited portion at Col. 10, lines 32-49 of the Myers et al. patent describes the "ray casting" process by which points of two-dimensional images are mapped into a three-dimensional space. There is nothing in this cited section that teaches or suggests applicants' step of separating objects by color.

Like the Myers et al. patent, the Pfeiffer et al. patent contains no disclosure or suggestion of separating objects within a video frame by color. In the absence of any suggestion in either of the Myers et al. and Pfeiffer et al. patents of applicants' separating step, the combination of references would not teach all of the features of applicants' claims 1-5. For that reason, applicants request withdrawal of the 35 U.S.C. 103(a) rejection of these claims.

35 U.S.C. 103(a) Rejection of Claims 6-10

The examiner has Finally Rejected claims 6-10 under 35 U.S.C. 103(a) as obvious over the Myers et al. patent, in view of the Pfeiffer et al. patent, further in view of U.S. Patent 5,280,530, issued January 18, 1994, in the name of Timothy I. P. Trew et al. Applicants respectfully traverse this rejection.

Applicants have discussed the Myers et al. and Pfeiffer et al. patents above in connection with the 35 U.S.C. 103(a) rejection of claims 1-4. In the interest of brevity, applicants will not repeat a discussion of these patents again. For the purposes of the instant rejection, neither Myers et al. nor Pfeiffer et al. teach applicants' step of separating objects from the background based on color as recited in claim 4, and incorporated by reference in claims 6-10.

The Trew et al patent, discussed at length in applicants' prior response, concerns a method of tracking a moving object in a scene by forming an initial template of an object and

then dividing the template into sub-templates. Each sub-template in a successive frame is searched and the displacement to a corresponding sub-template in a preceding frame is calculated to enable mapping of the displaced positions to produce an updated template.

Like the Myers et al. and Pfeiffer et al. patents, the Trew et al. patent contains no disclosure or any suggestion of applicants' step of separating objects from the background based on color as recited in claim 4, and incorporated by reference in claims 6-10. Indeed, the Trew et al. patent says nothing at all about color. Therefore, combining the Trew et al. patent with the Myers et al. and Pfeiffer et al. patents would not yield all of the features recited in applicants' claim 4, and incorporated by reference in claims 6-10, respectively.

Applicants claims 6-10 are patentably distinct over the references of record for another reason. Claims-6-10 each incorporate the feature of using a user-selected centroid/reference point to first select an object of interest and then tracking that object using a Kalman predictive algorithm. As discussed previously, the Trew et al. patent contains no disclosure or suggestions of such a feature. At best, the Kalman filter disclosed in Trew is not applied with respect to performing tracking based on a user-selected centroid/object of interest, as recited in claim 4 and incorporated by reference in claims 6-10.

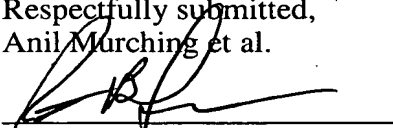
Applicants' claims 6-10 patentably distinguish over the combination of Myers et al., Pfeiffer et al. and Trew et al. Accordingly, applicants' request withdrawal of the 35 U.S.C. 103(a) rejection of claims 6-10.

Conclusion

In view of the foregoing accompany remarks, applicants deem the application in condition for allowance and solicit such action. If, however, the Examiner believes such action cannot be taken, the Examiner is invited to contact the applicant's attorney at (609) 734-6820, so that a mutually convenient date and time for a telephonic interview may be scheduled.

No fee is believed due. However, if a fee is due, please charge the additional fee to
Deposit Account 07-0832.

Respectfully submitted,
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CERTIFICATE OF MAILING

I hereby certify that this amendment is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to Mail Stop AF, Commissioner for Patents, Alexandria, Virginia 22313-1450 on: March 29, 2004

3-29-04
Date

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